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THESIS

A COST BENEFIT ANALYSIS OF THE NAVAL RESERVE FORCE FRIGATES

by

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December, 1994

Principal Advisor: William R. Gates

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This thesis analyses the Naval Reserve Force Oliver Hazard Perry class (FFG-7) guided missile frigates. It assesses the cost-effectiveness of operating these ships in the Naval Reserve fleet vice the Active fleet. The study begins with a brief history of the Naval Reserve Force (NRF) and outlines its current role and mission. A cost identification and comparison of operating the FFGs in each fleet follows. To capture all of the relevant costs, this comparison is based on a model developed by the RAND Corporation and modified to meet the needs of this study. The analysis then assesses the ship's operational readiness by comparing the ships' performance on Combat System Assessments and the major engineering exams. Following this, the quality of life on board the NRF FFGs is qualitatively evaluated. This analysis concludes that using FFGs in the NRF is not the most cost-effective option. Alternative recommendations are then provided for their more efficient use.

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ABSTRACT

This thesis analyses the Naval Reserve Force Oliver Hazard Perry class (FFG-7) guided missile frigates. It assesses the cost-effectiveness of operating these ships in the Naval Reserve fleet vice the Active fleet. The study begins with a brief history of the Naval Reserve Force (NRF) and outlines its current role and mission. A cost identification and comparison of operating the FFGs in each fleet follows. To capture all of the relevant costs, this comparison is based on a model developed by the RAND Corporation and modified to meet the needs of this study. The analysis then assesses the ship's operational readiness by comparing the ships' performance on Combat System Assessments and the major engineering exams. Following this, the quality of life on board the NRF FFGs is qualitatively evaluated. This analysis concludes that using FFGs in the NRF is not the most cost-effective option. Alternative recommendations are then provided for their more efficient use.

TABLE OF CONTENTS

I. INTRODUCTION

A. BACKGROUND

The demise of the Soviet Union, the destruction of the Berlin Wall, the reunification of Germany and the apparent end of the Communist threat in the late 1980's has eliminated the menace that dictated our defense policy since the culmination of World War II. With the end of the Cold War, the size of this country's military budget came under close scrutiny. The lack of a potential superpower foe combined with ever increasing budget deficits became the catalyst for the largest reductions to the military budget since the end of World War II.

In response to the changing geopolitical environment and tightening fiscal constraints, the Department of Defense was forced to reassess and restructure its forces. The result of this process has been the largest drawdown of the United States military in the post Vietnam era. Despite the smaller size of the military, its responsibility to support this nation's interests around the world has not changed. The end of the Cold War did not eliminate world conflict. It eliminated the once-bipolar alignment of the NATO and Warsaw Pact countries and allowed for multipolar disturbances, including: the invasion of Kuwait which lead to the Gulf War, the conflict in Bosnia, the violence in the former Soviet republic of Georgia, the genocide in Rwanda, and the ongoing return of democracy to Haiti. In fact, the military has been called on more often in the six years since the collapse of the Soviet Union than it was in the six years prior to its collapse.

As a result of the tumultuous world climate, the military has been required to do more with less. Each service has been forced to enhance and streamline its capabilities in order to maximize efficiency. With further reductions to both

personnel and budgets projected into the foreseeable future, each service must seek every opportunity to optimize the use of its resources in order to maintain the operational readiness required to support national interests.

B. PURPOSE

> There is much "good news" in the report to document the substantial progress the Navy has made in improving its war-fighting capability at an affordable cost through increased reliance on the Naval Reserve. The Navy has made the tough choices necessary in an era of diminishing resources to streamline its force structure, to equip its reserve component with modern, fleet-compatible equipment and to shift certain mission capabilities from the Active to the Reserve forces. [Ref. 1]

This statement, made in the Navy's report to Congress on the Navy's Total Force Policy, highlights the increased efforts to use Naval Reserve forces as a more cost-effective way to provide for the defense of this country. The Total Force concept, an integrated force of active, reserve, retired military, federal, civilian and contractor personnel was viewed as a means of reducing the defense budget while maintaining the forces required for national security. It was generally assumed that transferring forces and missions to the Reserves would result in substantial savings due to the lower personnel and operating costs.

The purpose of this thesis is to conduct a cost-benefit analysis of operating the Oliver Hazard Perry class frigates (FFG-7) in the Naval Reserve Force (NRF). The primary research questions to be addressed are listed below.

1. Primary Research Questions

- What are the actual financial savings realized by operating the Oliver Hazard Perry (FFG-7) class frigates in the Naval Reserve Force vice the regular Active Force?

- How does the combat readiness of the Naval Reserve Force FFG-7 class frigates compare to that of the ships in the active fleet?

- Does the reduced manning of the Naval Reserve Force FFG-7s present a degradation in the quality of life for the active duty portion of the crew?

- Is the utilization of the FFG-7 class frigates in the Naval Reserve Force the most cost-effective use of these ships?

C. METHODOLOGY

This cost-benefit analysis is based on an existing cost model developed by the RAND Corporation which used active/reserve F-4 airplane squadrons and Knox class (FF-1052) frigates as its base.[Ref. 2] The model will be modified utilizing data from the Navy Visibility and Management of Operating and Support Costs (VAMOSC) data base to conduct a cost comparison between Naval Reserve Force (NRF) (FFG-7) class frigates and Active Force (AF) frigates.

Following this analysis the operational readiness of the Naval Reserve Force ships will be assessed and compared to that of the Active Force ships. Operational readiness will be determined based on each ship's combat efficiency as measured by the standard inspections and examinations conducted on all ships in the U.S. Navy. Each ship, be it active or reserve, is held to identical standards on the major inspections: Operational Propulsion Plant Examination (OPPE), Combat System Assessment (CSA), Refresher Training (REFTRA), and a host of others. The results of these inspections will be utilized to determine if there is a significant difference between the readiness of the Active and Reserve Force ships.

Upon conclusion of the quantitative cost analysis and operational readiness assessment, a qualitative analysis will be conducted focusing on the quality of life issues raised by the reduced manning on the Reserve Force ships and the reduction of deployable ships available to the entire fleet.

These results will be considered when assessing the cost effectiveness of operating the Oliver Hazard Perry class guided missile frigate in the Naval Reserve Force.

D. ORGANIZATION OF STUDY

The remaining chapters of this thesis are organized as follows:

Chapter II: **UNITED STATES NAVAL RESERVE**

This chapter begins with a brief historical background of the United States Naval Reserve Force and the role it has played in the defense of this country. It will then detail the concepts behind the current Total Force Policy and what this means for the Naval Reserve in the future. Finally it will describe the Oliver Hazard Perry (FFG-7) class frigate and its role in the Naval Reserve Force.

Chapter III: **COST MODEL AND ANNUAL COST IDENTIFICATION**

This chapter discusses the cost model developed by the RAND Corporation [Ref. 2] and explains the modifications required to adapt this model to the Oliver Hazard Perry (FFG-7) class frigates. This adapted model is then applied to the Active and Reserve (FFG-7) fleets utilizing data from the Navy Visibility and Management of Operating and Support Cost (VAMOSC) data base to accurately capture the average cost of operating a ship in each fleet.

Chapter IV: **READINESS AND QUALITY OF LIFE ISSUES**

This chapter assesses the operational readiness of ships in both the Active and Reserve fleets drawing on major inspection results and official readiness studies conducted by the Commanders of the Navy Atlantic and Pacific Surface Fleets (COMNAVSURFLANT, and COMNAVSURFPAC). Quality of life issues such as deployment rotation and ship's manning are also addressed in this chapter.

Chapter V: **CONCLUSION AND RECOMMENDATIONS**

This chapter presents the conclusions drawn from the analysis conducted and makes recommendations to more efficiently exploit the resources of the United States Navy, the Naval Reserve, and specifically, the Oliver Hazard Perry (FFG-7) class frigates.

II. UNITED STATES NAVAL RESERVE

A. HISTORICAL BACKGROUND

The roots of our present day Naval Reserve can be traced back to the American Revolution. In November 1775 the Continental Congress established the Continental Navy which consisted of two converted merchant ships. This "navy" eventually grew to number fifty three ships at its peak. The ships of this fleet were all converted merchants, fishing schooners and lightly armed private yachts. In contrast, the British at the time possessed the most formidable navy in the world; consisting of 131 ships in 1775 and growing to 468 ships by the end of the war in 1783. The British fleet not only outnumbered the fledgling Continental Navy, its "ships of the line" were specifically designed as combatants. In order to counter the superior British fleet the Continental Congress called upon the individual state naval militias and privateers to augment the regular navy. [Ref. 3]

Following the victory over England, the Continental Navy was largely disbanded; and again, the responsibility for coastal defense fell primarily on the individual state's naval militias. The Civil War exposed the inherent weakness of this policy by dividing the northern and southern naval forces and pitting them against one another. On July 24, 1861, Congress authorized the hiring of ships for "the temporary increase of the Navy." Eventually, more than half of the Union fleet consisted of "reserve ships." [Ref. 4]

The first attempt to create an "official" Naval Reserve occurred on February 17, 1887, when Senator Washington C. Whitthorne of Tennessee introduced a bill before Congress that would "create a Naval Reserve of auxiliary cruisers, officers and men from the mercantile marine of the United States." Although the bill was not passed, it did inspire the Navy Department to begin organizing the state naval militias. In

1891, these militias began training with the regular Navy. That same year, Federal funds were turned over to the states to help support their naval militias. In August, 1893, Congress passed an act that authorized the temporary loan of Navy vessels to the states for training purposes. Finally, the Naval Militia Act was passed on February 16, 1914, which placed the state naval militias under the supervision of the Navy Department. [Ref. 4]

The first test of the newly organized Naval Reserve occurred on April 6, 1917, when the United States declared war on Germany and entered into World War I. Over 300,000 "citizen sailors" were called to active duty, and by the end of the war more than 60 percent of the personnel on active duty were Naval Reservists.[Ref. 4] Following the war, the state naval militias were dissolved and the federal government became solely responsible for maintaining the United States Naval Reserve.[Ref. 5]

World War II brought about the largest military build up in history. Reserve personnel on active duty in the Navy during this period numbered over 3 million and accounted for over 80 percent of the Navy's total personnel strength. [Ref. 4] Of the approximately 320,000 officers on duty in 1945, over 300,000 were Reservists. In 1946, after the war, the Naval Air Reserve Training Command and the Naval Surface Reserve Training Command were established and headquartered in New Orleans, Louisiana under the Chief of Naval Reserve. This move marked the beginning of the modern Naval Reserve.[Ref. 5]

B. MISSION

The mission of the United States Naval Reserve under Title 10 of the U. S. Code is to provide trained units and qualified personnel to augment the Active Forces in time of war, national emergency and at such other times as national security requires.[Ref. 6] Since the end of World War

II the Naval Reserve has been called upon in many times of crisis, including Korea, Vietnam, and most recently the Gulf War. In each instance the Reservists have served with distinction and contributed significantly to the advancement of this country's security and national interests.

As the Navy moves to ready itself to meet the new challenges and threats of the world, as outlined by former Secretary of Defense Les Aspin in The Bottom-up Review[Ref. 7] and by former Secretary of the Navy Sean O'Keefe in ...From the Sea[Ref. 8], the Naval Reserve will be called upon to play a greater role in this country's defense.

> As the Naval Forces shift from a Cold War, open ocean, blue water naval strategy to a regional, littoral, and expeditionary focus, Naval organizations will change. Responding to crises in the future will require great flexibility and new ways to employ our forces.[Ref. 8]

One of the immediate tasks listed in ...From The Sea is to restructure the Naval Reserve for immediate crisis response and peacetime contributory support.[Ref. 8] This presents a significant departure from the recent training focus of the reserve, which was to prepare for operation along with carrier battle groups. This emphasis on flexibility and speed will pose a new challenge, as well as new opportunities for the Naval Reserve Force.

C. TOTAL FORCE POLICY

> The military capability of the United States has never resided exclusively in the active component. America has always depended upon reserve forces and our mobilization base to maintain, in peacetime, capabilities that would be required in war.[Ref. 9]

The end of the United States involvement in Vietnam on 27 January, 1973, brought with it a radical change to the structure of the Department of Defense. Mandatory conscription was abandoned and the U.S. military became an "all-volunteer-force." Along with this change came the adoption of the Total Force Policy. The major objective of the policy has been to strike a balance between maintaining the minimum active peacetime force required to promote this country's national interests while simultaneously maintaining a credible defense force. The two guiding principles of the Total Force Policy are: 1) that reserve forces are the primary augmentation element for the active force, and 2) the total force relies on integrated use of all available forces, to include: active, reserve, retired, civilian, and allied.[Ref. 9]

In 1983, due in part to rapidly escalating defense budgets as well as slow implementation by the services of the Total Force Policy, Congress directed that each service provide for greater utilization of Reserve Forces in all mission areas. In the subsequent years, the Navy completely adopted the Total Force Policy and assigned the reserve force to more demanding wartime missions. Beginning in 1987, the Navy implemented a policy of "Horizontal Integration," assigning the same modern ships, aircraft and equipment to the Naval Reserve that were present in the Active Forces.[Ref. 1] Between 1987 and 1992 a total of 35 ships were transferred into the Naval Reserve Fleet (NRF).

D. OLIVER HAZARD PERRY CLASS FRIGATES

The Oliver Hazard Perry (FFG-7) class guided missile frigates were designed as a low cost/high quantity replacement for the aging Gearing and Forrest Sherman class destroyers. A total of 51 ships were commissioned between 1977 and 1989 with four more built and sold to the Royal Australian

Navy.[Ref. 10] They were designed as relatively small, low cost ships that could be employed effectively to counter a wide range of potential threats. Their primary mission is anti-submarine warfare. However, their Mark 13 guided missile launcher which fires both SM-1 anti-air missiles and Harpoon anti-ship missiles posing a very credible anti-air and anti-ship capability. The ships regularly operate with two LAMPS SH-60B helicopters which are primarily used as ASW platforms but can also be used to provide over the horizon targeting.

Today, the Oliver Hazard Perry (FFG-7) class guided missile frigates represent the largest and most modern class of ships in the Naval Reserve Force. Of the 51 ships in the class, 16 have been assigned to the NRF. This comprises a substantial portion of the Navy's surface escort forces. The NRF ships will be utilized alongside their Active Force sister ships as escorts for Aircraft Carrier Battlegroups, Amphibious Assault Groups, Combat Logistic Forces, and convoyed merchant ships. They could also be tasked to fight as part of a Surface Action Group or a Surface ASW unit. In fact, the only operational limitation imposed on the NRF ships is the restriction from participating in long term peacetime deployments.

III. COST MODEL AND ANNUAL COST IDENTIFICATION

A. COST MODEL

The cost analysis portion of this thesis is based on the methodology developed by John F. Schank of the RAND corporation in 1986.[Ref. 2] The RAND Defense Manpower Research Center developed the model for the Office of the Assistant Secretary of the Defense for Reserve Affairs when Congress was reviewing the Total Force concept. The model describes a methodology for estimating the annual operating and support costs of units in the active and reserve forces. The only costs considered relevant in this model are the annual recurring costs of unit personnel, peacetime equipment operations, and maintenance requirements. "Sunk" costs, such as equipment research and development costs, procurement costs, and the fixed costs of force administration are omitted from the RAND model. As defined by Schank, the relevant cost elements to be considered are Table 1.

One of the objectives of the model was to create a general methodology that could be used to provide consistent estimates across all types of units for all of the services. To accomplish this objective, Schank used data bases that were generic across the services so that meaningful comparisons could be made between Army, Navy, and Air Force units. Since the focus of this thesis is the Oliver Hazard Perry class of Guided Missile Frigates, some of the restrictions imposed by the RAND model are not necessary for this analysis.

UNIT COST ELEMENTS
1. <u>Unit personnel costs</u> Pay and allowances Acquisition and training of personnel Military retirement Other (including travel, TAD costs, and additional training)
2. <u>Equipment operating and maintenance costs</u> Petroleum, oil, and lubricants Maintenance supplies Training ordnance Spare parts Intermediate level maintenance Depot level maintenance Purchased services (including rentals, communications, printing, etc)

Table 1. Unit Cost Elements.
(Source: RAND Cost Model)

There is another deviation from the RAND model. Rather than estimating the future cost of operating and supporting the Active and Reserve force frigates, this chapter draws on historical data to accurately identify the actual recurring costs associated with maintaining the ships in each fleet. The change in emphasis from future costs to past expenses required several modifications to Schank's methodology. These modifications will be highlighted throughout this chapter.

The results of the cost comparisons in this chapter are presented in tabular form, and broken down, where applicable, to each cost element. The results of each table are compiled and transferred to a final summary table (Table 9) and presented graphically at the end of this chapter.

B. PERSONNEL-RELATED COSTS

In the RAND model, personnel-related costs are broken into four elements: pay and allowances, acquisition and training of replacements, military retirement, and other costs. In the Navy, the acquisition and training process is front-loaded, meaning that it is incurred almost exclusively by the Active Force. The active side of the service engages in recruiting and then incurs the expense of creating sailors and officers out of the recruits at boot camp and through the various officer commissioning programs. The reserves acquire personnel directly from the active ranks when they either retire or choose not to re-enlist. These personnel arrive at the reserve units fully trained and become reservists at no additional cost to the Reserve Forces. Including the costs of recruiting and training creates an additional cost burden for the active force that benefits the reserves. For the purpose of this analysis the costs of recruiting and training are assumed to be incurred by both components of the Navy equally, because they are not included in the personnel-related costs of either the active or reserve ships.

The major personnel difference between the Active Force ships and the NRF ships is the level of manning. The Oliver Hazard Perry class was designed around the concept of "minimum manning." The ships possess weapons systems and propulsion plants which are highly automated. They do not require the extensive manpower of the older systems on the ships which the FFG-7s replaced. The full crew complement for an active force FFG-7 is 16 officers and 198 enlisted.

The NRF ships, although conceptually reserve or part-time forces, have a significant number of full-time personnel. The full-time personnel, or "core crew," are responsible for the continuing ship administration, support, and equipment maintenance that can not be delegated on a part-time basis. The full time portion of the NRF crew is usually 70-75 percent

as large as a regular active crew. This core crew is augmented by the reserve portion of the crew, which consists of Selected Reservists, who ideally bring the ship up to its full complement for operations and training exercises. However, the NRF ships often participate in local operations and training with only the core crew embarked. The manning comparison between the Active Force ships and the NRF ships is broken down in Table 2.

MANNING LEVELS OF THE FFG-7 CLASS FRIGATES		
TYPE	AF	NRF
OFFICERS / FULL TIME	16	14
ENLISTED / FULL TIME	198	145
TOTAL / FULL TIME	214	159
OFFICERS / SELECTED RESERVE	0	2
ENLISTED / SELECTED RESERVE	0	54
TOTAL /SELECTED RESERVE	0	56
TOTAL CREW	214	215

Table 2. Manning Levels of the FFG-7 frigates.
(Source: Bupers Manning Document)

1. Pay and Allowances

The military payroll system is exceptionally complex. A service member's base pay is determined by a combination of their rank and the number of years they have been in the service. In addition to their base pay, members are eligible to receive a plethora of allowances and special duty payments, including: Basic Allowance for Quarters (BAQ), which depends on rank and marital status; Variable Housing Allowance (VHA), which is based on rank and geographical location; Career Sea Pay (CSP), which is paid to qualified personnel based on rank and time at sea; Hazardous Duty Pay; Flight Deck Pay; Re-enlistment Bonuses; Family Separation Pay; and numerous

others. Two individuals in identical paygrades, performing identical jobs could be paid significantly different amounts depending on their location, years of service, collateral duties, and whether or not they are married. The comparison between the total pay and allowances paid averaged across the active force ships and the NRF ships is broken down in Table 3.

PAY AND ALLOWANCES ($ FY 1992 MILLIONS)		
TYPE	AF	NRF
OFFICER	.769	.734
ENLISTED	4.547	3.612
TOTAL	5.316	4.346
RATIO[1]	81.75%	

Table 3. Pay and Allowances.
(Source: VAMOSC Data Base)

[1] Total cost of NRF pay and allowances divded by the total cost of the Active Force pay and allowances.

The results displayed in Table 3 are consistent with the difference in the manning levels between the Active Force ships and NRF ships. Pay and allowances for the NRF ship are only 81.75 percent of the active force ship, representing an 18.25 percent savings per ship.

2. Military Retirement

The military retirement system is as complicated as the military pay system. Up until recently, the future costs of retirement had always been carried as an unfunded liability to the federal budget. The funds for military retirement were appropriated on an annual basis and only covered the expected outlays for the current year's retirement payments. Beginning

with the 1985 budget, Public Law 98-94 required the Department of Defense to fund the military retirement system as an ongoing liability. This requirement forced the services to include the costs for accruing future retirement benefits in their annual personnel budget.

The annual retirement accrual charges are calculated by the DoD Office of the Actuary, and are expressed as a Normal Cost Percentage (NCP) of the total annual base pay expenditures for each service. Different percentages are calculated for active and reserve personnel, and the figures are applied to the personnel end-strength numbers for each component. The NCPs are based on several factors which include the flow of personnel through the services and assumptions about future economic conditions. Due to volatile economic climates and continual changes in military requirements, the NCP figures are revised with each new budget, making it difficult to produce reliable estimates for individual unit retirement costs.

Due to the many problems encountered with trying to affix a reliable cost to military retirement benefits, Schank included these costs separately in the RAND model. He used two different methods, single and dual accrual, to account for retirement costs. A comparison of the results showed that retirement costs did not appreciably change the outcome of the analysis. For the purpose of this thesis, the dual accrual method will be explained below and used to identify the average retirement costs incurred by ships in the each fleet.

The dual accrual method of calculating retirement costs applies a different NCP to the active and reserve components of the navy. Retired reserve personnel do not receive any entitlement until they turn 60, and personnel who retire off active duty receive their entitlement immediately upon separation. Because the active duty retiree receives payment sooner and for a longer period of time, the NCP for active

duty personnel is considerably higher than that for retired reserve personnel. Based on data published by the Office of the Actuary, the NCPs for fiscal year 1992 were 36.8 percent for active duty, and 10.7 percent for reserves. [Ref. 11]

Schank's model and the NCP figures published by the Office of the Actuary, attempt to estimate future costs based on anticipated and projected information. As the focus of this thesis is directed at identifying past expenses, several basic assumptions must be incorporated to utilize the available data. These assumptions apply primarily to the NRF ships, and are explained below in the calculations.

Determining the retirement costs for Active Force ships is a relatively straightforward procedure. Using the pay figures from Table 3 and applying the proper NCP provides an average retirement cost for the Active Force ships. This calculation is displayed in Table 4. The mixed crews of the NRF ships prevent using the same method to determine an average retirement cost for the reserve ships. However, using the manning data from Table 2 combined with the pay data from Table 3 produces figures compareable to those calculated by Schank, in the RAND model.

According to the manning information provided in Table 2, the full time core crew of the NRF ship is 25 percent smaller than the full time crew of the Active Force ship.[1] The pay data provided in Table 3 reveals that the NRF payroll is only 18.25 percent smaller than the Active Force payroll. The working assumption for this analysis is that the 6.75 percent difference between the full time personnel reduction and the payroll reduction represents the portion of the payroll

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[1] 159 full time personnel on the NRF ship divided by the 214 full time personnel of the AF ship. (159/214=75%)

accounted for by payments to reserve personnel.[2] Using this assumption, the retirement costs for the NRF ships can be determined using the separate NCPs for the active and reserve portion of the crews. The results of these calculations are presented in Table 4 along with the Active Force figures.

RETIREMENT ACCRUAL COSTS ($ FY 1992 THOUSANDS)		
	ACTIVE DUTY	RESERVE
ACTIVE FORCE SHIPS PAY (from Table 2) NCP factor SUBTOTALS	 5,316 36.8% 1,956.3	 0 0 0
AF TOTAL	1,956.3	
NRF SHIPS PAY (from Table 2) NCP factor SUBTOTALS	 (4,346 X 93.25%) 4,053 36.8% 1,491.5	 (4,346 x 6.75%) 293 10.7% 31.4
NRF TOTAL	1,522.9	
RATIO	77.8%	

Table 4. Military Retirement Accrual Costs. (Sources: BUPERS, VAMOSC, DoD Office of the Actuary)

3. Other Personnel Costs

The category of other personnel costs is a catch-all category that addresses personnel related expenditures not covered by the pay and allowances category. The financial totals for this category are relatively small in comparison to

[2] 18.25 percent reduction in payroll, subtracted from the 25 percent reduction in personnel. (25%-18.25%= 6.75%).

the pay and allowances and military retirement categories, but they are included in this analysis to more accurately identify the annual costs of operating and supporting the ships and crews.

One of the primary elements of this category is the travel costs of ships personnel for training, administrative reasons, permanent change of station (PCS), and other purposes such as homeport travel entitlement, special aircraft charters, crew rotation and deployment. Travel costs include commercial transportation charges, rental of passenger carrying vehicles, mileage allowances, subsistence for travelers, per diem allowances, and incidental travel expenses. Also included in this category are the Temporary Additional Duty (TAD) costs of supporting personnel while they are assigned as shore patrol or other short term assignment. TAD costs are payed out of the ship's training budget rather than from the Military Personnel budget.[Ref. 12]

The average other personnel costs for AF and NRF ships are listed in Table 5. The 17.17 percent savings recognized by the reserve ships is a direct reflection of their reduced manning. Not only do the reserve ships have fewer full time personnel to send to schools, etc., but the core crew concept dictates that personnel are less likely to be sent away for training and other reasons because of the extreme strain that would present for the already undermanned crew.

OTHER PERSONNEL COSTS ($ FY-92 THOUSANDS)	
AF	NRF
35.77	29.63
82.83%	

Table 5. Other Personnel Costs.
(Source: VAMOSC data base FY-1992)

C. EQUIPMENT OPERATING AND MAINTENANCE COSTS

The RAND model defines the elements that comprise equipment operating and maintenance costs to include petroleum, oil and lubricants (POL), training ordnance, maintenance supplies, spare parts, depot level maintenance, other higher level maintenance, and services purchased from outside sources. These costs vary widely based on the operating tempo (OPTEMPO). The OPTEMPO for a ship is roughly equivalent to the number of underway steaming hours per year. The OPTEMPO for an Active Force ships is determined by where it is in its deployment cycle. A deployment cycle lasts approximately 18 months. At the beginning of the cycle, the ship goes through a maintenance period, known as a maintenance availability. During this phase the underway time is minimized and the ship is given time to repair and update equipment and weapon systems. Following the maintenance availability, the ship gradually increases its underway time and begins the inspection phase. The ships crew is tested by outside sources to determine whether or not it can operate the ship safely. After passing the inspection phase, the ship begins the training phase. It participates in training exercises, called pre-deployment work-ups, with the battle group with which it will be deploy. Following the Pre-deployment work-ups, an Active Force ship will make a 6 month deployment; usually to the western Pacific (WESTPAC) for West Coast ships, and to the Mediterranean Sea for East Coast ships; recently ships from both coasts have been deploying in support of the Middle East Force (MEF) as well.

Unlike their Active Force sister ships, the NRF ships do not make regular deployments. In fact, they are prevented by law from participating on extended deployments in deference to their reduced manning levels. Although they do not deploy, the NRF ships participate in all other phases of the cycle. The

ships have identical maintenance plans and possess the same type of equipment. The NRF crews are subject to the same inspections and standards and the ships participate in most of the same exercises. Because they don't deploy, the NRF ships are often involved with a larger number of local operations than their Active Force sister ships.

Part of the cost savings envisioned by the Total Force Policy is the projection of lower maintenance costs for the NRF ships as a result of their reduced OPTEMPO. Table 6 shows the difference between the underway and inport steaming hours between the Active Force and NRF ships. As expected, there is a significant difference between the underway steaming hours. NRF ships register 33.7 percent fewer steaming hours. The number of inport steaming hours are much closer, with the NRF ships registering only 11.29 percent fewer hours. The difference is due in large part to the inport training conducted on the NRF ships for the augmentation crews of Selected Reservists. The reservists are required to report for their active duty for training (ACDUTRA) drills one weekend a month. Often these weekends do not coincide with normal fleet training exercise for the Active Forces.

STEAMING HOURS		
TYPE	AF	NRF
UNDERWAY	2566.09	1701.25
RATIO	66.30%	
INPORT	1308.06	1160.44
RATIO	88.71%	
TOTAL HRS	3874.15	2861.69
TOTAL RATIO	73.87%	

Table 6. Annual Steaming Hours.
(Source: VAMOSC data base FY-1992)

1. Material Costs

The first three cost elements of the equipment operating and maintenance costs category; Petroleum, Oil, and Lubricants (POL), training ordnance, and maintenance supplies; are extremely straightforward and simple to calculate. Ships consume these materials in their everyday operations. In order to replenish these materials, the ship's supply department must requisition the items from the Navy stock system, weapons stations, and fuel ships or barges. The requisitions are compiled by the VAMOSC data base and recorded for each ship on an annual basis. Table 7 lists the average costs of these three material categories as reported by the Active Force and NRF ships. As expected, the material costs ratio of 70.69 percent, as calculated in Table 7, corresponds closely with the total steaming hour ratio of 73.87 percent calculated in Table 6.

MATERIAL COSTS ($ FY 1992 THOUSANDS)		
MATERIAL TYPE	AF	NRF
PETROLEUM, OIL, LUBRICANTS	1,117.66	715.88
TRAINING ORDNANCE	432.57	344.56
MAINTENANCE SUPPLIES	365.11	293.44
TOTAL MATERIAL COSTS	1,915.34	1,353.88
RATIO	70.69%	

Table 7. Equipment Related Material Costs.
(Source: VAMOSC data base FY-1992)

The other element that falls under the material costs category is the cost of spare parts drawn from the Navy Stock Account (NSA), and other repair parts, procured by the ship for use in maintenance and up-keep of the ship and its installed equipment. These parts are requisitioned by the

ship's supply department, as are the materials listed above. Unfortunately, there is an anomaly in the VAMOSC data base in this category with regards to the NRF ships. All sixteen of the NRF ships, according to the VAMOSC data base, reported no expenditures for repair parts in fiscal year 1992. Repeated calls to the Naval Center for Cost Analysis, the organization responsible for the VAMOSC data base, were unsuccessful in acquiring reliable data for this cost element. Based on the assumption that spare parts costs would closely resemble the other material cost ratios, and given that those ratios correspond closely with the steaming hours ratio, the NRF spare parts cost figure was estimated by applying the steaming hour ratio to the average cost of spare parts for the Active Fleet. These calculations and figures are:

Spare parts costs:	AF	\$582,370
		X 73.87%
	NRF	\$430,196

2. Maintenance Costs

Due to the minimum manning concept employed on the Oliver Hazard Perry class frigate, the ship's class maintenance plan is designed to rely on significantly more help from off-ship maintenance organizations than the plans of their predecessors. These maintenance organizations are divided into two levels, Intermediate Maintenance Activities (IMA) and Depot level maintenance activities. The IMAs consist of Navy repair ships and Navy shore-based maintenance facilities. The depot level maintenance is conducted by both military and private shipyards. The depot level activities primarily conduct ship overhauls and other major repairs. All higher level maintenance is the responsibility of the Supervisor of Shipbuilding, Conversion and Repair (SUPSHIPS), who provides the data for these cost elements to the VAMOSC data base for all ships in the Navy.

The higher level maintenance provided by the IMAs and at the depot level depends on where the ship is in its deployment cycle. For the purposes of this thesis, both the Active fleet ships and the NRF ships were assumed to be evenly distributed throughout all phases of this cycle. The depot level maintenance data provided in the VAMOSC data base supports this assumption, with an equal proportion of the NRF and Active Force ships undergoing depot level overhauls. Based on this assumption, the maintenance expenses for all of the ships in each fleet were averaged, to give a representative cost for maintaining any one ship for a year regardless of where it is in its deployment cycle. These figures are presented in Table 8.

Surprisingly, the higher level maintenance costs for the NRF ships are slightly larger (4.26%) than those for the Active Force. This can only be attributed to the reduced full time work force available on the NRF ships. The much larger (25.69%) increase for IMA level maintenance over that for depot level maintenance (3.19%) supports this assessment. IMA maintenance primarily focuses on routine type repair work that is beyond the capability of the ship's force, it is logical to assume that with fewer workers available, more work would fall into this category. Depot level maintenance, on the other hand, usually consists of major upgrades and repairs conducted in shipyards, work the ship's force, be it active or reserve, is not usually qualified to perform. Consequently the totals for depot level work in Table 8 are nearly identical.

HIGHER LEVEL MAINTENANCE COSTS ($ FY 1992 THOUSANDS)		
TYPE	AF	NRF
INTERMEDIATE MAINTENANCE ACTIVITIES	313.26	393.75
RATIO	125.69%	
DEPOT LEVEL	6,303.06	6,504.38
RATIO	103.19%	
TOTAL HIGHER LEVEL MAINTENANCE	6,616.32	6,898.13
RATIO	104.26%	

Table 8. Higher Level Maintenance Costs.
(Source: VAMOSC data base FY-1992)

3. Other Costs

The remaining cost element, purchased services, is a catch-all category that includes all direct ships costs that are not covered by the other categories. These services include rental of ship's vehicles, printing services, utilities consumed while the ship is inport, ship's phone services, laundry services, tug and pilot fees in foreign ports, and other port services which are provided by other than navy activities. The Active Force ships consume a significantly larger portion of these services than the NRF ships: $309,910 as compared to $52,190.[Ref. 11] This can be attributed to the larger crew size and higher OPTEMPO. The larger crew size drives up the costs of the personnel dependent services such as utilities and phone expenses, while the Active Force ships' deployment schedules and higher OPTEMPO drive up the costs of port services.

D. SUMMARY

The cumulative results of this cost analysis are presented in Table 9 and graphically in Figures 1 and 2. The overall annual savings realized by operating an Oliver Hazard Perry class frigate in the Naval Reserve Force vice in the Active Fleet amounts to $2,108,080, or a 12.59 percent savings. When this figure is multiplied by 16 ships in the NRF, the overall annual savings to the Navy amounts to $33,729,280. The interesting part of this cost analysis is the fact that the NRF ships, despite their reduced OPTEMPO, are forced to spend more money on intermediate and depot level maintenance to offset the reduction in their full time work force.

SUMMARY TABLE OF CUMULATIVE COST TOTALS ($ FY 1992 THOUSANDS)		
TYPE	AF	NRF
PAY AND ALLOWANCES	5,316.00	4,346.00
RETIREMENT ACCRUAL	1,956.30	1,522.90
OTHER	35.77	29.63
TOTAL	7,308.07	5,898.53
PERSONNEL RATIO	80.71%	
PERSONNEL SAVINGS	1,409.54	
POL	1,117.66	715.88
TRAINING ORDNANCE	432.57	344.56
MAINT. SUPPLIES	365.11	293.44
SPARE PARTS	582.37	430.20
IMA MAINT	313.26	393.75
DEPOT MAINT	6,303.06	6,504.38
PURCHASED SERVICES	309.91	52.19
MAINT. TOTALS	9,432.94	8,734.40
MAINT RATIO	92.59%	
MAINT. SAVINGS	698.54	
CUMULATIVE TOTAL	16,741.01	14,632.93
TOTAL RATIO	87.41%	
TOTAL SAVING	2,108.08	

Table 9. Summary of Cumulative Cost Totals.
(Source: Tables 1 through 7)

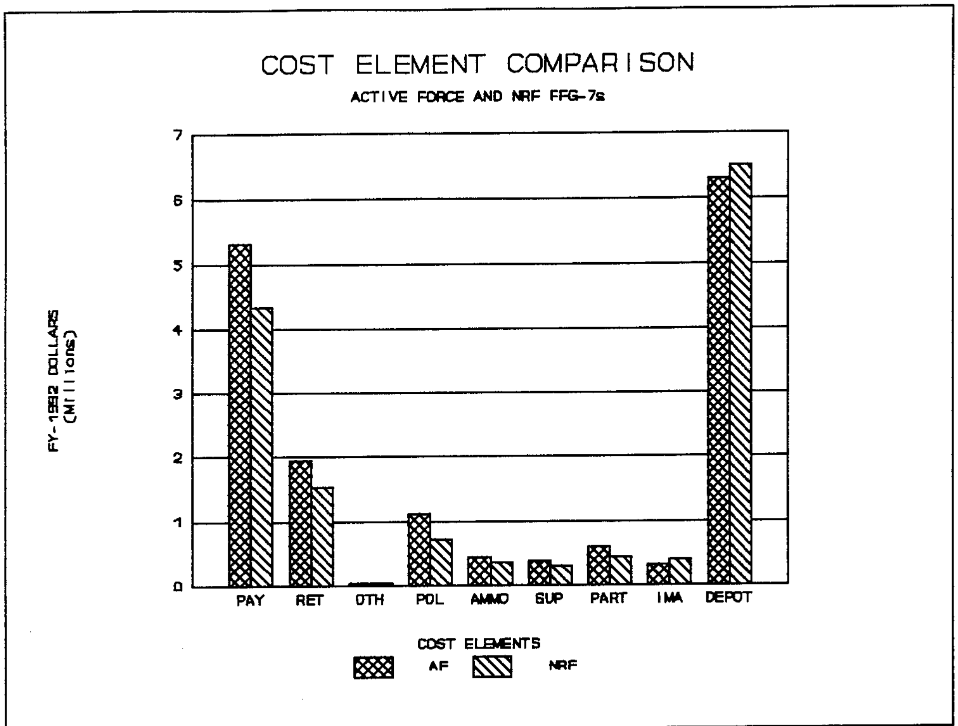

Figure 1. Cost Element Comparison

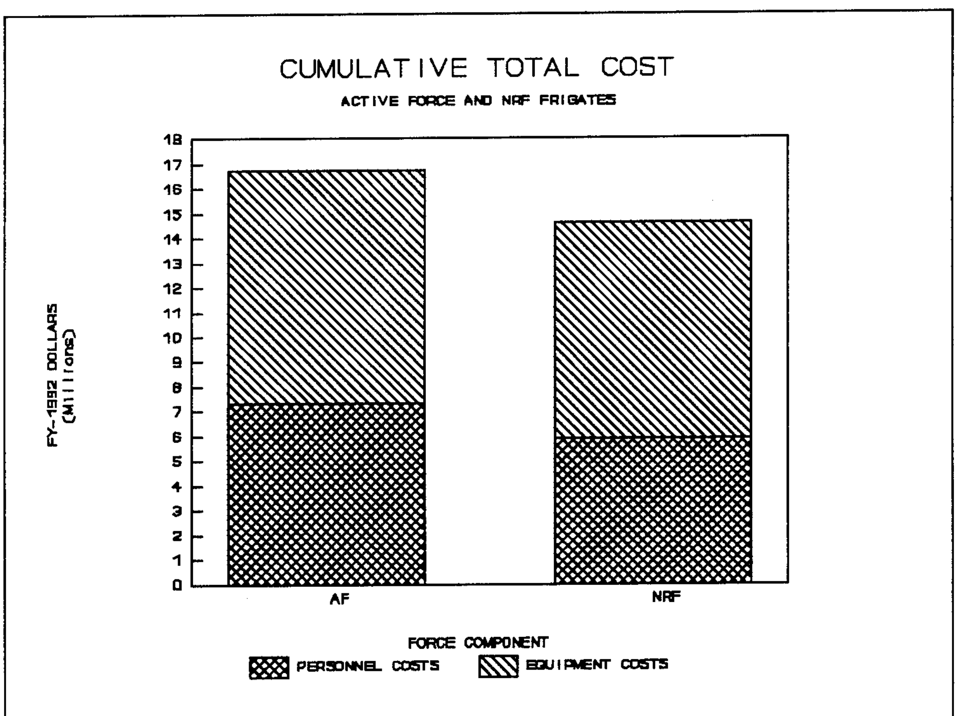

Figure 2. Cumulative Total Cost

IV. READINESS AND QUALITY OF LIFE ISSUES

A. OPERATIONAL READINESS

> I maintain, based on 27 months in command of one, that the NRF FFGs are not, and should not be expected to be, fully combat ready for immediate deployment into a high threat area. Our manning and employment policies are detrimental to their wartime readiness. They will never be equal to their active sister ships immediately upon mobilization because the selected reservist (SELRES) portion of the crew receives neither the quantity nor the quality of the training received by their active duty counterparts. [Ref. 13]

This rather ominous statement was made by a former Commanding Officer of one of the NRF FFGs. It echoes the findings of the COMNAVSURFPAC study group as reported in the Pacific Fleet NRF Frigate Study.[Ref. 14] This study, commissioned by CINCPACFLT, concluded that "NRF FFG-7s are materially comparable to the Active Force FFG-7s, but their combat system readiness is somewhat below the fleet norm."[Ref. 14] Results compiled by Pacific Fleet Propulsion Examining Board on Light Off Exams (LOE) and Operational Propulsion Plant Exams (OPPE) yield similar results. The first section of this chapter analyzes the overall operational readiness of the NRF frigates based on comparative results on Combat Systems Assessments (CSA), LOEs, and OPPEs. The next section of this chapter focuses on the Quality of life issues that affect the NRF FFG-7s as a result of their reduced manning.

1. Combat Systems Assessment

A Combat Systems Assessment (CSA) thoroughly inspects the material condition of a ship's combat system equipment, and evaluates the command training programs and the operator

proficiency of personnel involved in all phases of the combat systems warfare mission areas. The specific mission areas that are addressed by this analysis are:

- Anti-air warfare (AAW)
- Anti-submarine warfare (ASW)
- Command, Control, and Communications (C3)
- Electronic Warfare (EW)
- Auxiliary or Combat Support Systems

With regard to these mission areas, NRF ships are held to the same operational standards as their Active Force sister ships. Since a uniform standard of measurement is used, the CSA results of individual ships can be compared directly to judge one ship's readiness as compared to another. System readiness is judged by the CSA inspectors based on observed discrepancies. These observed discrepancies are categorized as: restrictive deficiencies, major deficiencies, minor deficiencies, and safety discrepancies. The differences between these categories are explained below.

A restrictive deficiency is a problem that would prevent satisfactorily completing any detect-to-engage (DTE) sequence. In a detect-to-engage sequence, a ship is required to detect, track, and engage a hostile target with all layers of its defense. Any problem, from unqualified personnel to broken equipment, that would interrupt this sequence for any of the weapons systems could be considered a restrictive deficiency. A major deficiency is defined as any problem which would significantly degrade performance in a primary mission area. A minor deficiency is defined as a problem that would adversely impact performance in a primary mission area or significantly impact performance in a secondary mission area.

Safety discrepancies are those problems that would create a serious hazard to the ship, other ships or aircraft, and/or the crew.

a. Anti-air Warfare (AAW)

Anti-air warfare involves detecting and identifying a hostile airborne threat, enemy aircraft or missile at the maximum distance possible on the ship's radar system. Once a threat has been identified, it is tracked by the ship's fire control system. When the threat conforms with all of the rules of engagement, it is engaged with missiles, guns, or both. The last two lines of ship's defense are the Close-in Weapons System (CIWS) and the chaff launcher. The CIWS will begin tracking a threat at a specified range, and will engage automatically when a minimum range is reached. The chaff launcher is used as a last resort to deceive the incoming threat. This is accomplished by firing large clouds of chaff that are designed to confuse the incoming threat's sensors. All of these systems, with the exception of the chaff launcher, are considered vital to the ship's AAW mission, one of its primary mission areas.

Figure 3 graphically displays the average number of discrepancies, in each category, for the AAW systems aboard the NRF ships as compared to that of the Active Force ships. This data shows that the NRF ships had an average of 27 total discrepancies as compared to the Active Fleet ships which averaged only 20.3 discrepancies. The one category where the NRF ships actually did better than the Active Force ships was in the most severe, restrictive category. Problems in this category are primarily a result of broken equipment. The Active Force ships' higher OPTEMPO and training tempo often increase wear and tear on the equipment beyond that seen on the NRF ships. The other categories of discrepancies are usually reflections of operator training and

effectiveness. Both of theses areas suffer on NRF ships due to their reduced manning, lower OPTEMPO, and the fewer training opportunities for the SELRES portion of the crew.

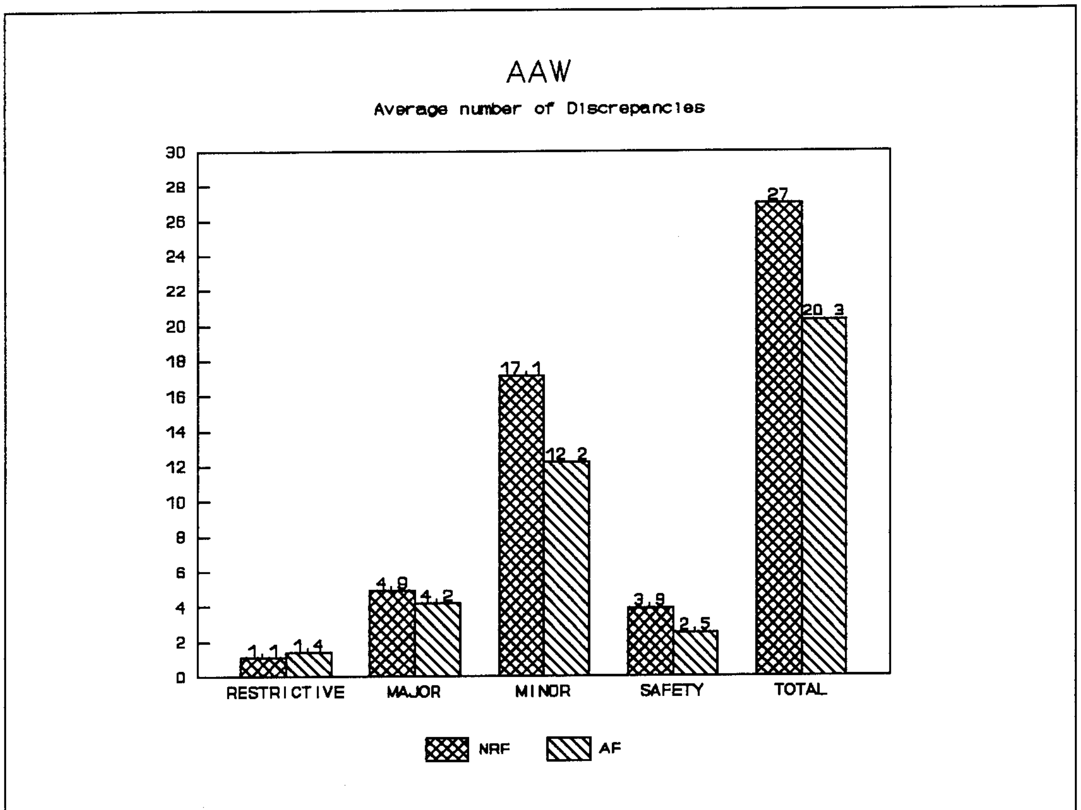

Figure 3. AAW Discrepancies
(Source: NRF Frigate Study)

b. Anti-submarine Warfare (ASW)

Anti-submarine warfare involves detecting and identifying a hostile submarine before it can get close enough to pose a threat to either the escort FFG-7 or the ships being escorted. This is accomplished using the ship's sonar systems, and the sonar systems deployed from the ship's LAMP SH-60B helicopters. When the tracked submarine becomes a threat to the ship or other ships in the fleet, it is engaged with torpedoes that can be fired from the ship or dropped from

the helicopters. Although the helicopters are considered an integral part of the ship's ASW weapons systems, the helicopter's air crews and material readiness are assessed separately at their squadron level. However, the ship is evaluated on its ability to exploit the information provided by the helicopters.

The comparative results of the ASW systems assessments are provided in Figure 4. Unlike the AAW systems, the minimum manning concept does not appear to have a large effect on the NRF ships' ASW readiness. In fact, the NRF ships performed marginally better than the Active Force ships in this area, tallying an average of 7.8 discrepancies as compared to 8.1 discrepancies for the Active Force ships.

There are several possible explanation for this. The sonar equipment and other related ASW systems are not as man-power intensive as some of the AAW systems. Thus, the full time crew members are not stretched as thinly when operating without the ship's augmentation crew. Similarly, they are not required to cover for the less trained SELRES portion of the crew when they are embarked. Another difference between the AAW and ASW systems is that effective ASW training can be conducted while the ship is in port. The systems have a test mode that simulates actual combat conditions and allows ASW teams to train without involving the entire ship. AAW systems have test modes as well, but the systems are all above the ship's water line so that training interrupts other day to day inport operations. Either way, the lack of full time personnel does not appear to have an adverse effect on NRF ASW readiness at this level.

Another measure of ship's ASW proficiency is its torpedo firing results. Over the two year period from July 1989 to July 1991 the NRF ships of the Pacific Fleet conducted seven live fire torpedo exercises and scored five hits, for a success rate of 71.4 percent. During the same time period,

the Active Force ships fired 46 torpedoes during live fire exercises, and scored 39 hits, for a success rate of 84.8 percent. These results point out two facts. The Active Force ships get more training opportunities to fire torpedoes; each active ship averaged two torpedo shots, whereas the NRF ships averaged less than one shot over the same period. In addition, the Active Force ships are more proficient in this area of ASW, probably as a result of their greater training opportunities.

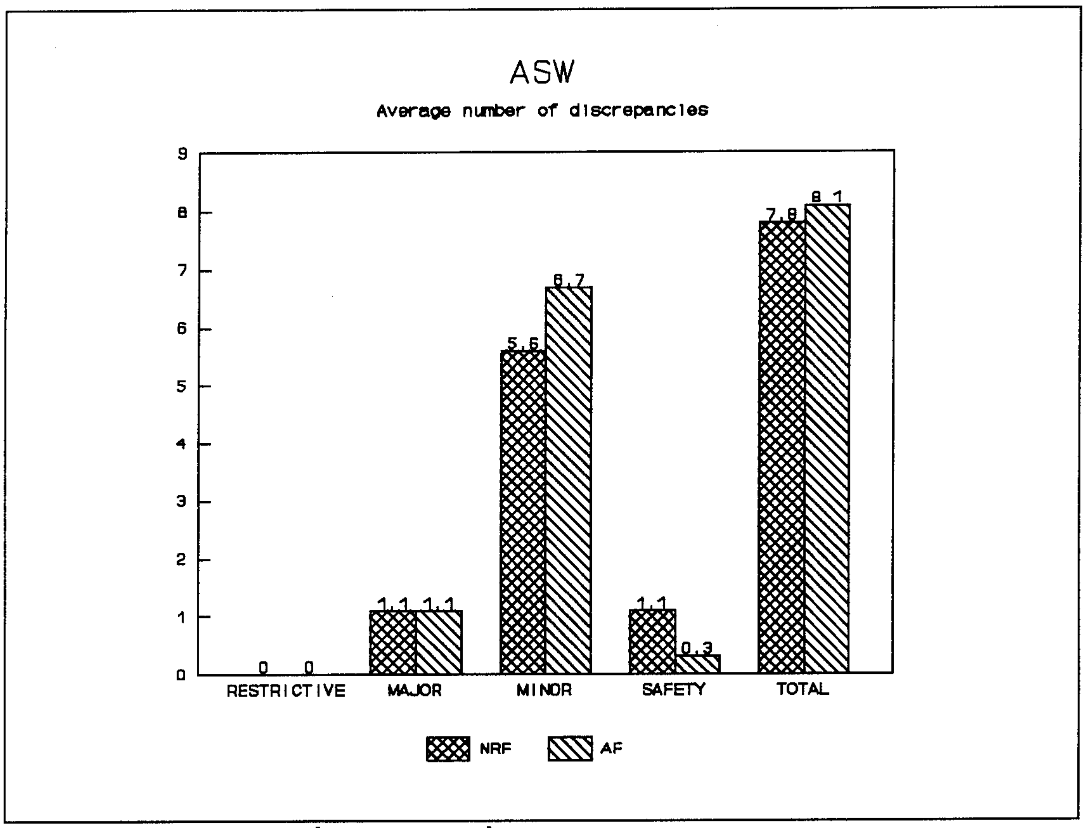

Figure 4. ASW Discrepancies
(Source: NRF Frigate Study)

c. Command, Control, and Communication

Command, Control, and Communication (C3) refers to the process of regulating strategy in a battle environment. The CSA's Command and Control portion tests the ship's

personnel responsible for controlling the weapon systems and challenges their understanding of the Rules of Engagement (ROE). The CSA's Communications portion tests the radios and sound powered phone systems that are used to relay information between the ship's weapon operators and their controllers. It also tests the secure radios and satellite communication systems used to communicate with other ships.

Figure 5 displays the comparative results of the C3 portion of the CSA. The data shows that the NRF ships averaged 28.2 deficiencies as compared to only 24.9 for the Active Fleet ships. The data also shows that the NRF ships recorded three times more restrictive and twice as many major deficiencies. These results are worrisome after realizing that the command and control portion of this test involves all of the ship's weapon systems, and determines whether or not the systems are fired when they are supposed to be. The results are not surprising due to the NRF ship's reduced fleet training. The Active Fleet ships and crews receive extensive training on the Rules of Engagement and command and control procedures during their pre-deployment work-ups, since the NRF ships do not deploy, they usually miss out on this training.

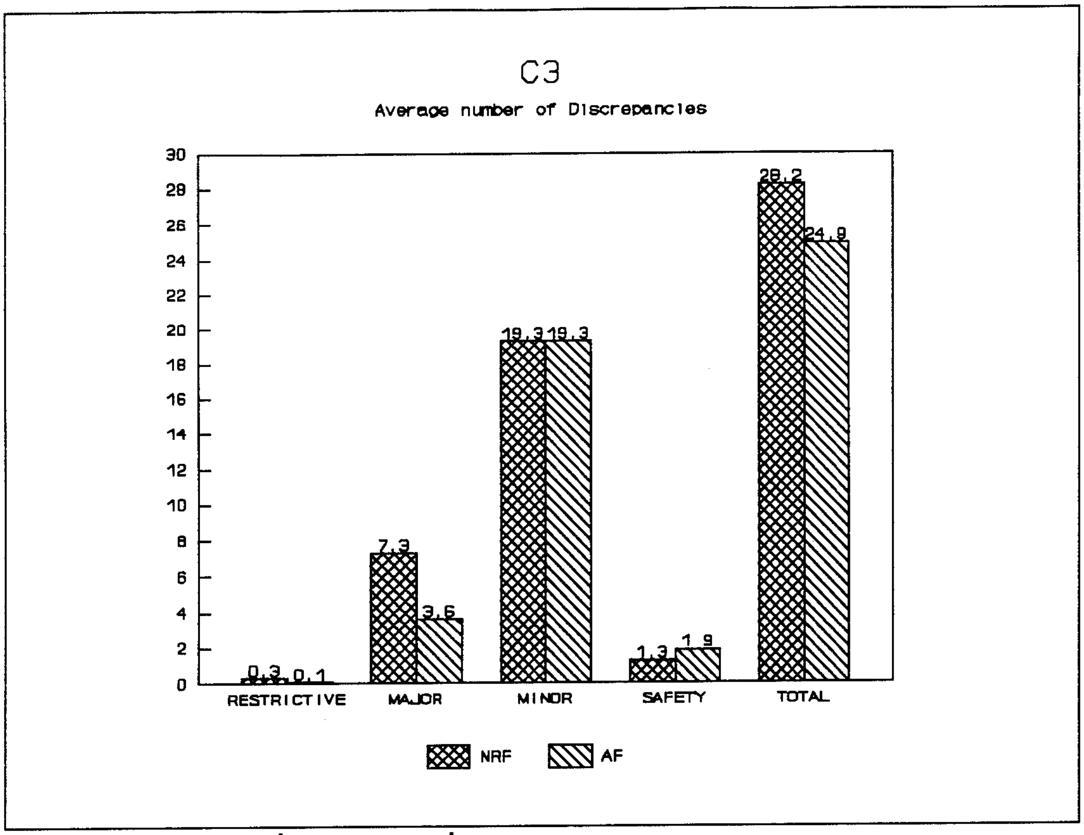

Figure 5. C3 Discrepancies
(Source: NRF Frigate Study)

d. Electronic Warfare (EW)

Electronic warfare pertains to using the electromagnetic spectrum to identify and target an enemy, or preventing enemy ships from using the spectrum to communicate with each other and target you. On the FFG-7,the AN/SLQ-32 both detects and jams enemy radar and radio signals. Additionally, equipment is simply turned off when a risk of being detected is present. Depending on the threat atmosphere, the emission control level (EMCON) specifies which equipment can be radiating and for how long. There are four levels of EMCON, A through D; EMCON A is the most restrictive and EMCON D is the least. Part of the CSA is to determine how quickly ships can set particular EMCON levels after detecting a threat.

Figure 6 displays the comparative results of the EW portion of CSA. These results show that the NRF ships scored better in this mission area than the Active Force ships, tallying an average of only 3.6 discrepancies compared to 5 for the active ships. As with the ASW systems, the AN/SLQ-32 is not a manpower intensive system. In fact, it requires only one operator to be fully mission ready. The system also contains extensive internal training capabilities which allow the operators to simulate almost any threat scenario while the ship is inport. This allows the SELRES portion of the crew to train on their ACDUTRA weekends, even when the ship is not underway.

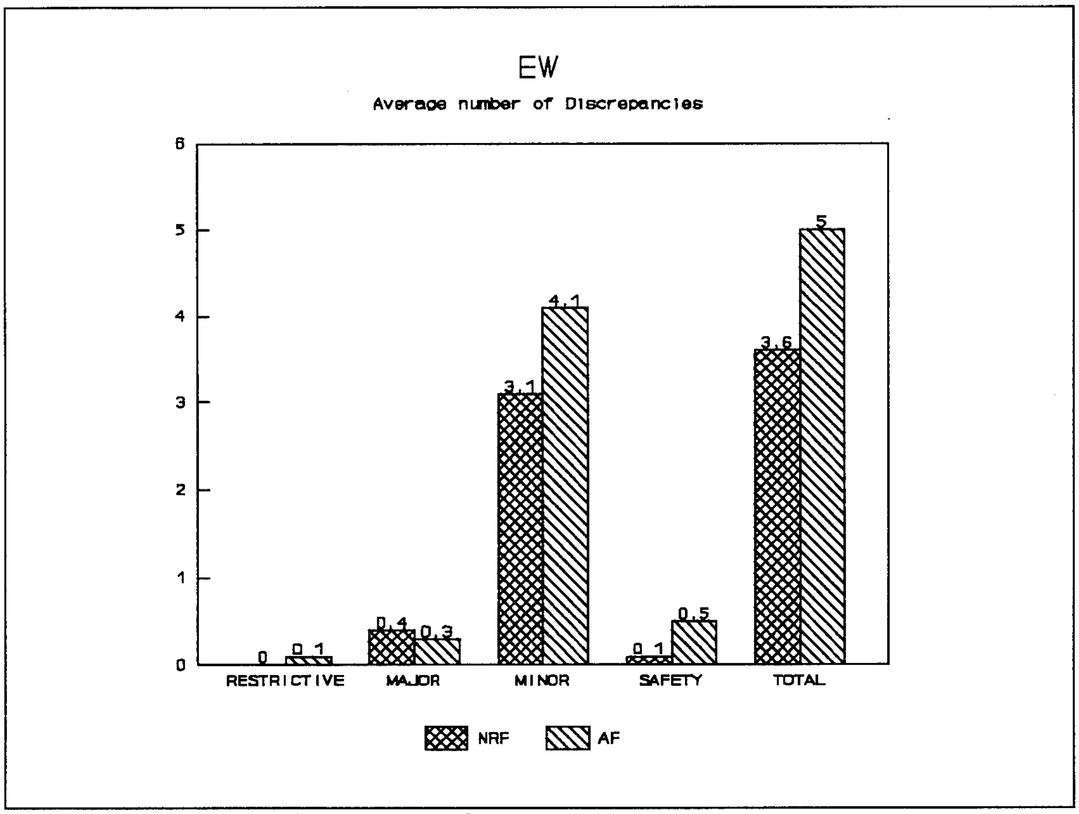

Figure 6. EW Discrepancies
(Source: NRF Frigate Study)

e. Auxiliary or Combat Support Systems

Auxiliary and combat support systems are vital to the operation of the weapon systems, but they are not directly related to mission objectives. For example, the ship's high voltage generators, high pressure dry air systems, and auxiliary cooling water systems are not part of the actual weapons systems, but they are crucial to weapon system operation. The auxiliary systems are usually operated and maintained by the ship's engineers, and not by the weapons systems operators.

The comparative CSA scores for auxiliary and combat support systems are displayed graphically in Figure 7. The Active Force ships clearly performed better in this phase of the assessment, tallying an average of 16.4 discrepancies as compared to the 20.9 average for the NRF ships. Much of this difference can be attributed to the reduced manning of the NRF ships. As will be shown in the engineering portion of this analysis, the engineering spaces of the NRF ships are severely taxed for personnel. They have trouble keeping up with their primary maintenance requirements and are often not able to maintain the auxiliary support systems properly.

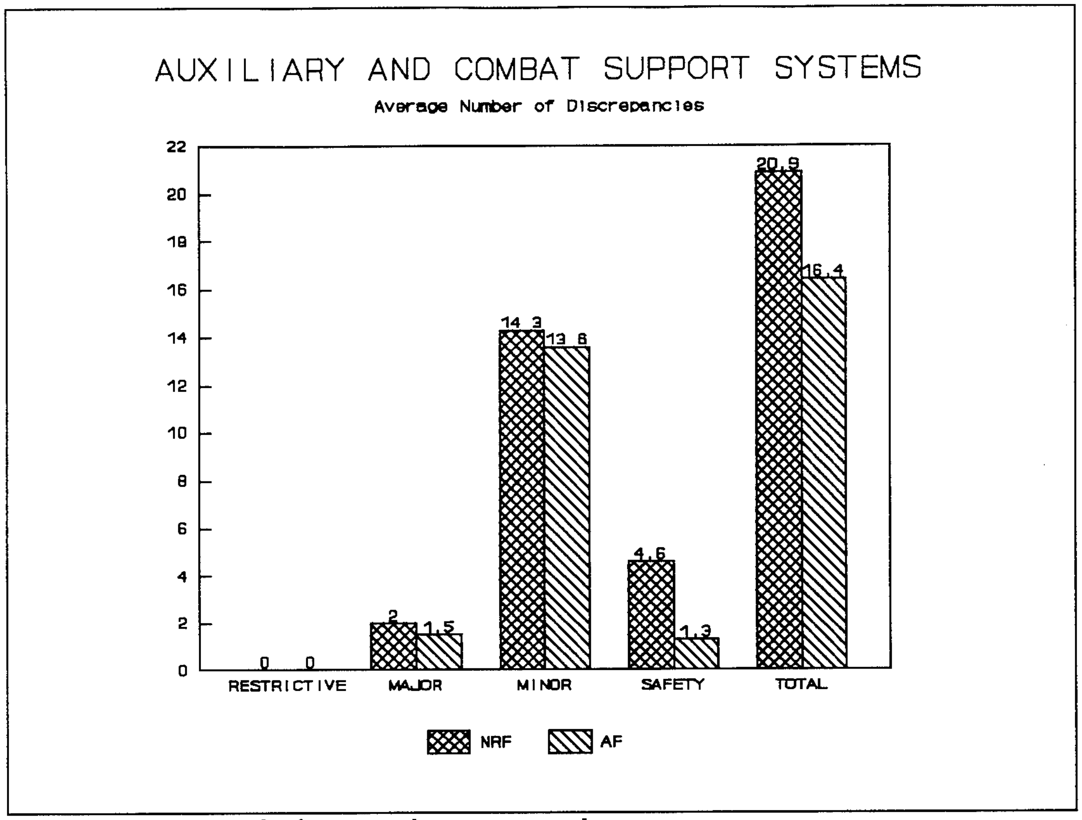

Figure 7. Auxiliary Discrepancies
(Source: NRF Frigate Study)

f. CSA Summary

The Combat Assessment Team in the NRF Frigate Study concluded that "existing data clearly indicates a lower level of Combat Systems Readiness on board our NRF ships."[NRF study] Based on the CSA data, this is hard to contest. In the five areas inspected by the CSA the NRF ships averaged a total of 87.5 discrepancies, compared to 74.7 for the Active Force ships. This represents 17.13 percent more discrepancies per CSA. There is a direct correlation between labor intensive missions and the areas where the NRF ships had the most trouble. On the systems that were less labor intensive and allowed greater availability to train, the NRF ship were equal to or marginally better than their Active Force sister ships. Conversely, the Active Force ships were markedly superior in the labor intensive missions areas.

2. ENGINEERING EXAMS

The two major engineering exams, Light Off exams (LOEs) and Operational Propulsion Plant Exams (OPPEs), are conducted on an 18-month cycle. They thoroughly inspect the material condition of ships' main and auxiliary engineering machinery spaces, evaluate the effectiveness of command training programs, and test the crews' level of knowledge and proficiency in engineering operation, administration, and firefighting. As with Combat System Assessments, there are no differences in examination standards or requirements between NRF and Active Force ships. This permits a direct comparison of each fleet's engineering readiness based on the relative scores on these exams.

LOEs and OPPEs are conducted in a similar fashion to the CSAs. The separate engineering functions, main propulsion, auxiliary machinery, and firefighting, are inspected separately using the four levels of deficiencies explained previously. However, the data available for this analysis was not reported in the same detail as for the CSAs. For this reason, the LOE/OPPE analysis focuses simply on the overall exams results, pass or fail. These results were obtained from the Propulsion Examining Board (PEB) examination data base for the years 1981 through 1991.

Figure 8 graphically compares NRF ships and Active Force ships. The comparison includes the number of exams given, the number failed, and the percentage failed. This data suggests that the NRF ships have a 54 percent greater chance of failing an LOE or OPPE than the Active Force ships.[3] This difference is attributed almost entirely to the minimum manning concept.

[3] 17.89% AF failure rate divided by the 27.59% NRF failure rate.

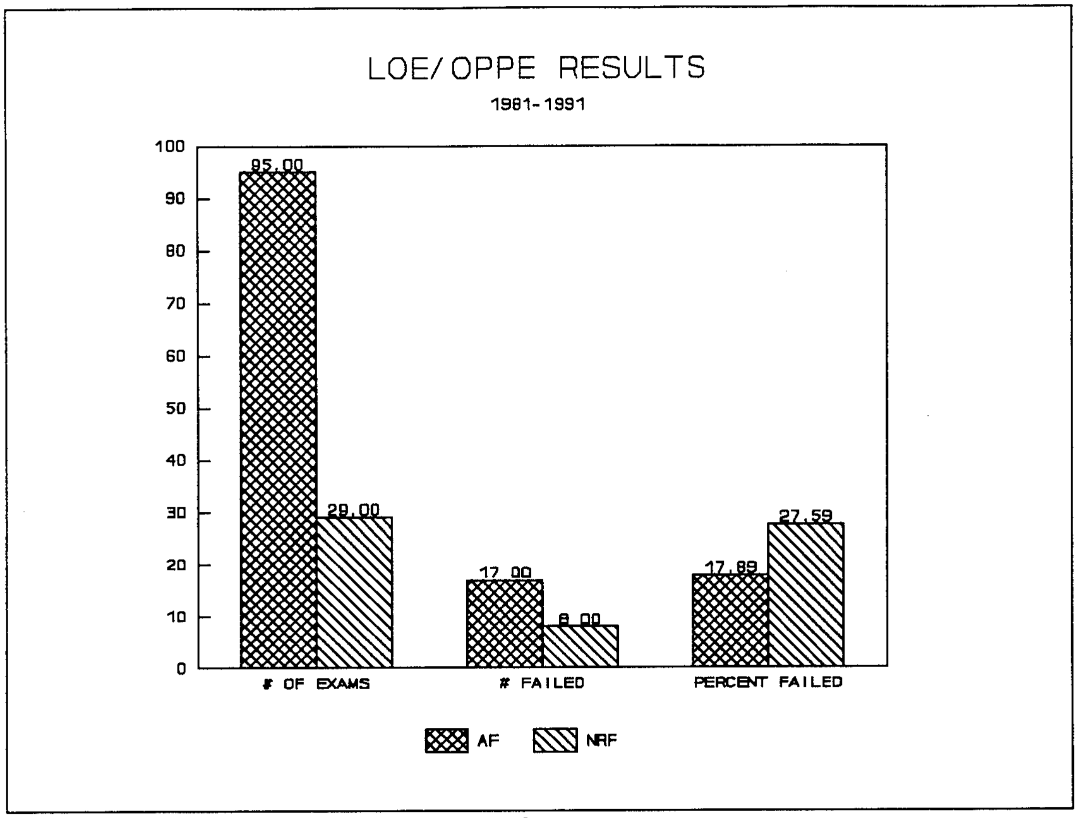

Figure 8. LOE and OPPE Results.
(Source: PEB Examination data base)

The following excerpts from a memorandum to the Surface Force Assistant Chief of Staff from the Force Naval Reserve Coordinator make this point quite clear.

> The fact that the NRF FFG's have reduced active enginemen manning with no associated reduction in workload presents a particular challenge to the Departmental leadership. Because of reduced manning senior enginemen spend a larger portion of their time on the deckplates performing preventative and corrective maintenance. This leaves them little or no time to perform their own management duties [eg. training]. [Ref. 15]

> ...half the active enlisted manning is comprised of selected reservists recalled to active duty in the TAR [Training and Administrative Reserve] program. Many do not have prior sea duty, or if they have, it may well have been in a different rate and rating [non-engineering]. There is an inherent learning curve associated with many of the key personnel.[REF 16]

The memo goes on to suggest numerous changes to the NRF manning policy to achieve better exam results, and attain a higher degree of readiness. The Force reserve coordinator concluded, "The [NRF] ships are not structured for success, they don't have the same quantity of people, and they don't have the same quality; the fact that any do succeed can only be attributed to the leadership of the khaki [officers and chiefs] on board."[Ref. 16]

B. QUALITY OF LIFE ISSUES

The minimum manning concept affects the NRF ships in many areas other than operational readiness. The reduced number of qualified watchstanders underway requires the crew members to stand more watches than they would on a fully manned ship. Personnel are often required to stand watches that do not conform with their rated specialty. For example, Fire Controlmen (FCs), who are responsible for the ship's guns and missile systems, are often assigned watch stations as radar scope operators in the Combat Information Center. For the ship, personnel become highly trained and very flexible. However, for the crew member, this training occurs at the expense of their rating specific knowledge and could compromise their performance on advancement exams.

The reduced manning also has an effect on the crew when the ship is in port. With fewer personnel available to complete daily maintenance, NRF crews often work longer hours on the ship compared to the crew of a fully manned Active

Force ship. Due to the Navy's requirements for inport emergency teams, the NRF Commanding Officers are often required to reduce the number of inport duty sections. Fully manned ships traditionally operate with four inport duty sections, meaning one fourth of the crew is required to be on the ship at all times. NRF ships often are forced into three duty sections inport, meaning each crew member must spend one of every three nights on the ship.

The only possible benefit received by a crew member stationed on an NRF ship is that the ships don't deploy. For crew members with families, this means that they won't have to leave their loved ones for six months at a time. However, young single personnel often join the Navy to "see the world." The ship's non-deployment status is not universally seen as a benefit. In return for this questionable benefit, the NRF crews are required to do the same amount of work as a fully manned ship with fewer personnel. They are rewarded for working harder by longer hours. The longer hours and out of rate watchstanding responsibilities reduce opportunities for in rate training, and could effect advancement. All of these factors combine to make the quality of life on board the NRF ships significantly worse than it is on the Active Force ships.

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

> We have already witnessed the challenges posed by the new dangers in operations like Just Cause (Panama), Desert Storm (Iraq), and Restore Hope (Somalia). Each of these was a "come as you are" campaign with little or no time to prepare our forces for the challenges they met. The new dangers thus demand that we keep our forces ready to fight as a top priority in allocating scarce defense resources.[Ref. 7]

Scarce defense resources have been one of most important factors in restructuring the U.S. Military. Each service has been forced to enhance and streamline its capabilities to maximize efficiency. In this climate, the Navy must seek every opportunity to optimize its resources to maintain the required operational readiness and minimize the taxpayer's cost. Assigning ships to the Naval Reserve Force is one way the Navy has tried to accomplish this goal.

The purpose of this thesis was to assess the Naval Reserve Force Frigates and to determine if these ships are being utilized in the most cost-effective manner. This was accomplished by answering four primary research questions.

- What are the actual financial savings realized by operating the Oliver Hazard Perry (FFG-7) class frigates in the Naval Reserve Force vice the regular Active Force?

- How does the operational readiness of the Naval Reserve Force FFG-7 class frigates compare to that of the ships in the active fleet?

- Does the reduced manning of the Naval Reserve Force FFG-7s degrade the quality of life for the active duty portion of the crew?

- Is the assignment of the FFG-7 class frigates to the Naval Reserve Force the most cost-effective use of these ships?

The first three of these questions were answered by the quantitative and qualitative analysis presented in Chapters III and IV.

The actual financial savings realized by operating the Oliver Hazard Perry (FFG-7) class frigates in the NRF vice the Active Force is approximately $2,108,080 per ship. This represents a 12.59 percent savings over the costs of supporting the same ship in the Active Force. The majority of this savings comes from the reduced personnel costs associated with the "core crew" policy on NRF ships. This policy staffs the ship with only 75 percent of the required full time personnel; an augmentation crew of Selected Reservists makes up the difference. The NRF personnel costs amount to only 80.71 percent of the active ship costs and account for 66.86 percent, or $1,409,540 of the overall savings.

The question of operational readiness was addressed in the fourth chapter. Based on the comparative results of each ships' performance during the Combat Systems Assessment and major engineering exams, the NRF ships are clearly at a lower overall state of operational readiness than their Active Force sister ships. Not surprisingly, this lower level of readiness can be attributed primarily to the reduced manning level on the NRF ships.

The NRF ships have the same equipment as the active ships and require the same amount of work to operate and maintain. With a 25 percent smaller full-time crew than an active ship's, the NRF ship's crew is spread more thinly and must work longer hours. This reduces, or even eliminates, time available for effective training. It often results in watchstanders who are more fatigued, less alert, and less trained than their counterparts on fully-manned Active Force ships.

The quality of life on board the NRF ships was compared to the Active Force ships in Chapter IV. The quality of life on the NRF ships is significantly lower than on their active sister ships. Again, this is directly related to the reduced manning issue. The full-time portion of the crew is required to work harder, work more often, receive less training, and is expected to compete equally with the crew of a fully-manned ship. It is not surprising that the re-enlistment rates on the NRF ships are often much lower than the Active Force ships and lower than the fleet average.

The remaining question of the NRF ships being cost effective addresses the overall purpose of this thesis. Based on the evidence presented in this analysis, it appears that using the Oliver Hazard Perry (FFG-7) class guided missile frigate in the Naval Reserve Force is not the most cost effective alternative.

The total monetary savings realized by the sixteen ship NRF fleet of amounts to $33,729,280. This is roughly equivalent to the cost of operating two FFGs in the Active Force. The cost of this financial savings is sixteen ships at a reduced level of operational readiness. Whether or not their level of readiness is "good enough" is impossible to determine except under actual battle conditions. However, the NRF ships have never been called into battle. In the Gulf War, Active Force ships were being extended on deployments, and being turned around and sent back on deployment after only 30 days, vice the normal 18 months. Still, the NRF ships were not mobilized. This indicates that either they were not needed or that the Navy's leadership lacks confidence in their abilities.

B. RECOMMENDATIONS

Ships are too expensive to not use. If the failure to utilize the NRF ships in the Gulf War indicates their future role in the Navy, then the Naval Reserve Force concept needs to be re-examined. One alternative would be to decommission two NRF ships and transfer the rest to the Active Forces. By decommissioning the two NRF frigates, the Navy could support the other fourteen ships in the Active Forces at no additional cost. These ships would be fully-manned, combat ready, and able to deploy around the world to support this country's needs. This idea strays somewhat from the Total Force Policy, and it proposes decommissioning two ships long before the end of their useful lives. A better solution would be to transfer all of the ships back into the Active Forces and look for savings with other types of units.

The Naval Reserve has traditionally excelled in several fields, including: medical units, mobile construction, cargo handling battalions, Military Sealift Command (MSC) military detachments, and several others. These types of units are well suited to the part-time reserves. Reserve medical personnel are usually doctors, nurses, and paramedics in their civilian jobs. They receive as much, if not more, training and experience as their active duty counterparts. Mobile construction and cargo handling are other areas where civilian skills cross directly into military applications. The ships of the Military Sealift Command (MSC) are primarily cargo ships and oil tankers. They do not possess the sophisticated weaponry and communication equipment of the Naval Combatants do. Because these ships, and their missions, are much simpler than the average war ship, the MSC military detachment can maintain and operate their equipment more effectively.

With the change in focus from an all out global war to regional "come as you are" conflicts, the Naval Reserve needs to reassess its priorities. It needs to concentrate on areas where it excels: medical units, cargo and construction battalion, etc. It should eliminate areas where it is struggling, including NRF FFGs. The Navy could recognize the same savings, if not more, by transferring total responsibility to the Naval Reserve for those missions that do not require specialized training. These units could draw on the selected reservists' civilian skills, rather than be forced to rely exclusively on military training received during weekend drills. In this scenario, reserve units would have a higher level of readiness before their specific military training even began; overall readiness would improve proportionately.

With down-sizing, or right-sizing, the Navy's leadership needs to avoid creating another "hollow force," like the one that resulted from the 1970's drawdown. The Navy needs to learn from its past mistakes. Continuing to support ships whose operational readiness has been degraded is not the way to build a smaller, more efficient Navy. The two million dollars saved will not seem so significant if and when the NRF ship is placed in a battle situation and fails.

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